

## HAZARD ANALYSIS

Work Plan Title: Work or Operation of COUPP 60 kg piping system

Date: Spring 2010

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Reviewed By:(optional) \_\_\_\_\_

Approved By: \_\_\_\_\_

Supervisor/Task Manager : Russ Rucinski, Rich Schmitt, or Mark Ruschman

### Description of work:

1.) Any work on the fluid piping system (hydraulic glycol, air, vacuum) such as making or un-making connections, adding components, or manipulation of valves and flex lines.

2.) Any work that involves operating the control system of the COUPP 60 kg bubble chamber via the C-More display or manually.

**Personal Protective Equipment:** (Check protective equipment required for the job.)

- |  |                                       |   |
|--|---------------------------------------|---|
| <input checked="" type="checkbox"/> Safety glasses                 | <input type="checkbox"/> Side shields | <input type="checkbox"/> Chemical splash goggles              |
| <input type="checkbox"/> Hearing Protection                        |                                       | <input type="checkbox"/> Hard Hats                            |
| <input type="checkbox"/> 3.0 Braising goggles                      |                                       | <input type="checkbox"/> Impact goggles                       |
| <input type="checkbox"/> Face shield                               |                                       | <input type="checkbox"/> Rubber apron                         |
| <input type="checkbox"/> Leather gloves                            |                                       | <input type="checkbox"/> Hot/Cold thermal protective gloves   |
| <input type="checkbox"/> Chemical resistant gloves (specify type): |                                       | <input type="checkbox"/> Respirators                          |
| <input type="checkbox"/> Other required PPE (specify):             |                                       | <input type="checkbox"/> Fall protection equipment (specify): |

**Equipment required for the job:** (List the tools needed to perform the job.)

Safety glasses, properly sized wrenches, consider gloves as appropriate to protect knuckles.

**Work Plan History Information:** (List any lessons learned accidents from this job, tips from previous jobs)

Hydraulic skid was witnessed to jump a few inches in the air when system had too much air in it and cylinder travel exceeded expectations during a fast compression. Stay clear of skid when system is in a de-compressed state.

1-1/2" hydraulic hose was witnessed to jerk powerfully enough to break three large plastic cable ties during a fast compression. Stay clear of hose when the system is in a de-compressed state. Do not handle hose when system is de-compressed.

## HAZARD ANALYSIS

Operation	Description	Hazards	Precautions / Safety Procedures
1	De-pressurizing and shutting down the system to remove stored and potential energy.	<ol style="list-style-type: none"><li>1. Injury to eyes from glycol or air release.</li><li>2. Injury from forceful hose movement due to an unexpected fast recompression trigger.</li></ol>	<ol style="list-style-type: none"><li>1. Wear safety glasses to protect eyes.</li><li>2. Assuming that the piping system is intact, sealed and in working order prepare to initiate a fast recompression by securing at least 6" of safety zone around the hose, skid, and vessel.</li><li>3. Trigger a fast recompression by hitting the "COMPRESS" button on the CMORE display.</li><li>4. Disconnect the house air line quick disconnect.</li><li>5. Open MV61, the air reservoir tank drain and leave open to bleed down the air tank. Verify on PI10 that the pressure reduces to zero.</li></ol>

2	<b>Making piping connections.</b>	<p>1. Injury from sudden change in system fluid state.</p> <p>2. Subsequent injury from high pressure leak due to improperly made up connection.</p> <p>3. Injury to extremity from slipping wrench or in tight clearances.</p> <p>4. Injury from slip off elevated work surface.</p>	<p>1. The system shall be de-pressurized as in operation 1.</p> <p>2. Since this system has relatively high pressures (up to several hundred psi), connections should only be made by experienced mechanical technician or engineering personnel.</p> <p>3. Consider the direction of force and how your hand, elbow, and wrench would move should the wrench slip or the connection spin unexpectedly.</p> <p>4. Some connections will require use of a ladder. Be conscious of your center of gravity. Inspect ladder before use. Optimize position and rotation of ladder.</p>
3	<b>Un-making piping connections.</b>	<p>1. Injury from sudden release of fluid or change in system fluid state.</p> <p>2. Injury to extremity from slipping wrench or in tight clearances.</p> <p>3. Injury from slip off elevated work surface.</p>	<p>1. The system shall be de-pressurized as in operation 1.</p> <p>2. Glycol is colorless and not always easily seen. Drain system into de-gassing tank, use containers, and/or use spill containment preferentially minimizing the possibility of a release. Clean up any spillage to prevent slippage or cross contamination.</p> <p>3. Consider the direction of force and how your hand, elbow, and wrench would move should the wrench slip or the connection spin unexpectedly. Only mechanical technicians should un-make mechanical connections.</p> <p>4. Some connections will require use of a ladder. Be conscious of your center of gravity. Inspect ladder before use. Optimize position and rotation of ladder.</p>
4	<b>Carrying out operations of the system using the CMORE display and or valve line-up</b>	<p>1. Injury from mechanical motion of skid or hose caused by a fast compression cycle.</p> <p>2. Unexpected</p>	<p>1. Know whether the system is in a compressed or de-compressed active or de-activated state. If de-compressed and control system and air is in active state, expect an unexpected fast compression and possible hose and skid motion.</p>

	changes.	operation such as relief valve opening. 3. Latent factor introduced that could lead to subsequent unexpected operation.	Do not reach into the skid when system is active and de-compressed. 2. Check the valve line-up against documented list for the operation. Reference the marked up flow schematic and understand fluid path and the operation before initiating it. 3. Only attended operation is allowed at this point. Leave system in a compressed state when operation is complete.
5	General manipulation of manual valves in the system.	1. Injury from mechanical motion of skid or hose caused by a fast compression cycle. 2. Glycol fluid leak to environment. 3. Latent factor introduced that could lead to subsequent unexpected operation.	1. Know whether the system is in a compressed or de-compressed active or de-activated state. If de-compressed and control system and air is in active state, expect an unexpected fast compression and possible hose and skid motion. Do not reach into the skid when system is active and de-compressed. 2. Except for de-pressurizing the system as in operation 1, manipulation of manual valves should only be done with an understanding of the consequences.
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